TRANSMITTING MESSAGES IN TELECOMMUNICATION SYSTEM COMPRISING A PACKET RADIO NETWORK

BACKGROUND OF THE INVENTION

[0001] The invention relates to transmitting messages in a telecommunication system comprising a packet radio network.

[0002] In the GSM system, short message services SMS have turned out to be extremely popular. Short messages are used for text-based messaging between users or to convey application data, such as WAP (Wireless Application Protocol) application data. Short messages are relayed by a short message service centre (SM-SC), which forwards short messages and stores and retransmits messages that have not been delivered. The SM-SC is able to receive a short message via any network for delivery to a mobile station MS. The SM-SC transfers a short message received to a gateway mobile switching centre for short message service (SMS-GMSC) to be delivered further to a mobile station. A mobile-originating short message is relayed via an interworking mobile switching centre for short message service (SMS-IWMSC) to the SM-SC to be delivered further. Signalling channels may be utilized in transmitting and receiving short messages; hence no separate traffic channel is required.

[0003] Short message services have turned out to be necessary also for the general packet radio service (GPRS) developed for the GSM system. The GPRS comprises serving GPRS support nodes (SGSN) and gateway GPRS support nodes (GGSN). The GGSN acts as a gateway to packet data networks (PDN), such as the Internet, i.e. from the point of view of an outside network PDN the GGSN acts as a router to a subnetwork. The SGSN serves mobile stations MS attached thereto in its service area, transmits and receives data packets from said mobile stations and monitors the location of mobile stations within its service

area. The attachment of an MS to a SGSN refers to the formation of a mobility management context for the MS, this function being called GPRS Attach in the GPRS system. In order for the short message service to be able to be utilized via a GPRS network, an interface Gd is standardized between the SGSN and the SMS-GMSC and the SGSN and the SMS-IWMSC. An MS attached to a GPRS network is able to transmit and receive short messages through the GPRS network via the interface Gd. An active PDP (Packet Data Protocol) context is not needed for transmission and reception of a short message, and so short messages are transmitted in a GPRS network using the signalling of the GPRS network. In a GPRS network, signalling is based on the use of GPRS traffic channels.

[0004] However, the problem is that the interface Gd is not obligatory in GPRS networks, and so the GPRS network does not have to support the transmission of short messages. If an interface Gs exists between the SGSN and a mobile switching centre (MSC/VLR), a mobile-terminated short message can be relayed from the MSC/VLR to the SGSN and further to the MS. The GPRS standard defines that a GPRS-attached but non-IMSI attached mobile station has to transmit short messages via GPRS channels. This causes problems since the MS does not know if the GPRS network supports the transmission of mobile-originated short messages via the GPRS network. If no Gd interface exists or the interfaces of the SMS-IWMSC are not updated to support a short message from the GPRS network, the transmission of short messages fails from the MS via the GPRS network.

BRIEF DESCRIPTION OF THE INVENTION

[0005] The object of the invention is to provide a method and an apparatus implementing the method so as to avoid the above problems. The objects of the invention are achieved with a method and a mobile station charac-

terized by what is stated in the independent claims. The preferred embodiments of the invention are disclosed in the dependent claims.

[0006] The invention is based on the mobile station transmitting messages via a first network offering circuit-switched services if message transmission failed via a second network offering packet-switched services.

[0007] The method and system of the invention provide the advantage that the transmission of messages intended to be transmitted to a packet-switched network can also be arranged in systems not supporting short message transmission via a packet-switched network. Owing to the solution, no changes are needed in networks, but, instead, the mobile station attends to the transmission to a circuit-switched network.

[0008] In accordance with a preferred embodiment of the invention, a mobile station transmits messages via a first network offering circuit-switched services if the mobile station is not attached to a second network offering packet-switched services. Message transmission to the first network can be made automatic, whereby messages can be sent without error messages and user intervention. The aim to always send messages via a second packet-switched network typically results in more efficient use of network resources. In accordance with a preferred embodiment of the invention, the first network is a GSM network and the second network a GPRS network. Message transmission via a GSM network typically requires suspension of the GPRS network service. The aim to always send messages via a GPRS network avoids the break in data transmission caused by the suspension and the signalling that consumes radio resources.

BRIEF DESCRIPTION OF THE FIGURES

[0009] In the following, the invention will be described in greater detail in connection with preferred

embodiments with reference to the accompanying drawings, in which

[0010] Figure 1 shows a GSM/GPRS system supporting short message services;

[0011] Figure 2 illustrates the structure of a mobile station according to a preferred embodiment of the invention; and

[0012] Figure 3 is a flow diagram of the operation of a mobile station in short message transmission according to a preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0013] The invention is applicable to any wireless telecommunication system in which a mobile station is able to transmit messages via a packet-switched network and a circuit-switched network. In the following, short message transmission according to a preferred embodiment of the invention is described in the GSM/GPRS system.

[0014] Figure 1 illustrates a wireless telecommunication system, in which a first network NW1 is a GSM network offering circuit-switched services and a second network NW2 is a GPRS network offering packet-switched services. Circuit-switched services of the GSM network to other networks PSTN (Public Switched Telephony Network) and ISDN (Integrated Services Digital Network) are offered by a mobile switching centre MSC/VLR that attends to connection set-up and routing calls to the right addresses. Two databases comprising information on mobile subscribers are used as assistance herein: a home location register (HLR) comprising information on all subscribers of a mobile network and the services ordered by them, and a visitor location register (VLR) comprising information on mobile stations visiting the area of a given mobile switching centre MSC/VLR. A more detailed description of the GSM system and short message transmis-

sion in a GSM network is given in the ETSI/GSM specifications and in '*The GSM system for Mobile Communications*', M. Mouly and M. Pautet, France 1992, ISBN:2-957190-07-7.

[0015] As was described above, the GPRS network NW2 comprises one or more operating nodes SGSN and gateway nodes GGSN. Both the circuit-switched GSM network (MSC/VLR) and the packet-switched GPRS network (SGSN, GGSN) utilize the same base station system (BSS). The BSS comprises base transceiver stations (BTS) communicating with mobile stations (MS) over the radio path, and base station controllers (BSC) controlling the radio frequencies and channels available to the base stations BTS coupled thereto. The MSC/VLR and SGSN are both also able to use the HLR, the SMS-IWMSC that relays short messages, and the SMS-GMSC. The SMS-IWMSC and SMS-GMSC are coupled to a short message centre (SM-SC) attending to the storage and forwarding of short messages.

[0016] Figure 2 illustrates the structure of a mobile station MS according to a preferred embodiment of the invention. The MS comprises a transceiver (Tx/Rx) that communicates via an antenna with the BTS. User interface (UI) means typically comprise a display, a keyboard, a microphone and a speaker. An MS also comprises a subscriber identity module (SIM) in which short messages, for example, can be stored. The MS comprises a memory (MEM) in which a code can be stored for execution by a central processing unit (CPU). The CPU uses the MEM, the Tx/Rx, the SIM and the UI to implement GSM means (GSMM) offering the GSM service, short message means (SMSM) offering transmission and reception of short messages, and GPRS means (GPRSM) offering the GPRS service. The GSMM, SMSM and GPRSM can be implemented by software by means of existing processors and memory; integrated circuits may also be used.

[0017] Figure 3 illustrates the transmission of short messages according to a preferred embodiment of the

invention. The need 300 to transmit a short message arises when the user of an MS has keyed in a short message and activated its transmission, or when data arrives for transmission as a short message from an MS application, such as the WAP. A chat application, smart messaging and the SIM Application Toolkit, for example, may also utilize short messages. In response to the need 300, a check 301 is made to see if the MS is attached to a packet radio network GPRS. This may be implemented by the SMSM checking from the GPRSM the state (MM State) of one or more current mobility management contexts (MM Context) of the MS. If at least one MM context is in READY or STANDBY state, the MS is attached to a GPRS network. If the MS is not attached to a GPRS network, the SMSM are arranged to use the GSMM to transmit 302 the message to the GSM network offering circuit-switched services. If the MS is attached to a GPRS network, the SMSM are arranged to use the GPRSM to transmit 303 the message to the GPRS network offering packet-switched services.

[0018] The SMSM are arranged to check 304 if short message transmission was successful. If so, the SMSM are ready to transmit 305 a new short message. Short message transmission may have failed for example because the SGSN or SMS-IWMSC does not support the interface Gd; in which case an error message is returned to the MS. If short message transmission failed, the SMSM and GPRSM are arranged to suspend 306 the packet-switched GPRS service (GPRS Suspension) from the GPRS network. The SMSM are arranged to use the GSMM to transmit 307 the short message to a GSM network. Once the short message (or several short messages) is transmitted, the offering of the packet-switched GPRS service may continue 308.

[0019] Suspension of GPRS Services 306 is needed at least for class B mobile stations. The suspension 306 may be arranged such that the SMSM request suspension of the service from the GPRSM when an error message is re-

ceived and the intention is to transmit a short message as GSM signalling via the MSC/VLR of the GSM network. The MS transmits a suspension message (RR Suspend) to the BSC. The BSC may terminate GPRS traffic to the temporary logical link identity (TLLI) of the MS. The BSC transmits the suspension message to the SGSN, and the SGSN transmits an acknowledgement message (Suspend Ack).

[0020] When the BSC determines that the MS no longer requires circuit-switched resources, it transmits a resumption request (Resume) to the SGSN. The SGSN transmits an acknowledgement (Resume Ack) to the resumption request. The BSC transmits a radio channel release request (RR Channel Release) to the MS, on the basis of which the radio channels possibly used by the MS are released. The MS may then transmit and receive data via the GPRS network (308). If the resumption request (Resume) or the radio channel release request (RR Channel Release) fails, the MS may continue the GPRS service by transmitting a routing area update request to the SGSN.

[0021] In accordance with a preferred embodiment of the invention, the user of an MS is offered the option to choose whether messages are transmitted via a GSM network or a GPRS network. The UI may display a menu, for example, allowing the user to carry out either of the settings:

[0022] a) short messages are always transmitted via a GSM network, or

[0023] b) the process is in accordance with Figure 3, i.e. the attempt is to transmit short messages via a GPRS network. The SMSM transmit the messages as selected by the user. The process is in accordance with Figure 3 at least when the intention is to transmit a short message via the GPRS network; however, it is possible to try to transmit short messages intended to be transmitted via a GSM network to a GPRS network.

[0024] The message to be transmitted does not

have to be a short message of the short message service SMS. The invention is applicable to any message service, such as transmissions of picture messages or messages containing multimedia information. Message transmission according to the invention is also applicable to other systems than the GSM/GPRS, for example to third generation telecommunication systems, such as the UMTS (Universal Mobile Telecommunications System) based on the core network of the GSM system and standardized by the 3GPP (Third Generation Partnership Project), or the third generation system standardized by the 3GPP2. Besides the short message service, a multimedia-messaging service is being developed for the UMTS.

[0025] It is apparent to a person skilled in the art that, as technology advances, the basic idea of the invention may be implemented in various ways. The invention and its embodiments are thus not restricted to the above examples, but may vary within the scope of the claims.